

Division's May Exhibit 22

CURRICULUM VITAE

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SUMMARY OF EXPERIENCE

Mr. Lips is a licensed professional geologist with 27 years experience in engineering geology and geomorphology in the western United States. He has conducted research, consulted, taught university classes, and provided expert witness testimony on geologic hazards, engineering geology, dam evaluations, mine reclamation and permitting, Earth surface processes, and environmental studies. Mr. Lips is currently the Principal Engineering Geologist of Great Basin Earth Science, Inc.

ACADEMIC AND PROFESSIONAL QUALIFICATIONS

Ph.D. A.B.D., Geography, University of Utah, Salt Lake City, Utah
M.S., Geology, Colorado State University, Fort Collins, Colorado, 1990
Graduate courses in Engineering, University of California, Berkeley, 1984-1985
B.A., Geology and Physics, Western State College, Gunnison, Colorado, 1983
Registered Professional Geologist, State of Wyoming No. 1489
Licensed Professional Geologist, State of Utah No. 5529142-2250
Member, Geologic Peer Review Board, Morgan County, Utah, 2008-present

PROFESSIONAL HISTORY

Great Basin Earth Science, Inc., Principal Engineering Geologist, 1995 - Present
Responsible for all aspects of providing consulting services for geologic hazard evaluations including faults, landslides, floods, debris flows, and rockfalls; surface and ground water investigations; stream characterization and restoration evaluations; geologic/seismic dam safety evaluations; and paleoenvironmental reconstructions.

University of Utah, Adjunct Associate Professor, 1999 - 2006; Adj. Assist. Professor, 1996 - 1999
Responsibilities include developing curriculum and teaching courses on geomorphology and surficial processes, geologic hazards, climate change, environmental studies, and natural resource management.

AGRA Earth & Environmental, Engineering Geologist, 1992 - 1995
Project manager for engineering geologic and geologic hazard investigations. Projects were for existing, proposed, and reclaimed mines, proposed subdivisions, utility corridors, commercial developments, and dams.

JBR Consultants Group, Engineering Geologist, 1985 - 1992

Project manager for engineering geologic investigations and mine permitting and reclamation projects throughout the western United States. Directed data collection and analysis, and prepared technical reports and permitting documents for new developments, proposed and existing mining operations, and for abandoned mines.

U.S. Geological Survey, Geologist, 1983 - 1985

Conducted research on landslides, floods, and debris flows in the western U.S. (primarily in central Utah); prepared publications on processes, recent events, methods of evaluations, and methods of risk assessment.

REPRESENTATIVE RESEARCH AND CONSULTING EXPERIENCE

Geologic Hazards Evaluations

Landslide Vulnerability Assessment, Project Impact, Salt Lake City, Utah: Served as chair of committee of geologists and engineers and was lead author of final report to Salt Lake City. Project consisted of conducting investigations and assessing the vulnerability for all property within the limits of Salt Lake City that could be impacted by landslides. In addition, lifelines entering the city, which if damaged or destroyed by landslides, would potentially result in loss of life and/or serious economic impact to the residents of the city, were considered.

Geologic Hazards Identification and Evaluation, Draper, Utah: Conducted evaluation of geologic hazards at two sites for a proposed salt storage facility in the Traverse Mountains, Draper, Utah. Hazards evaluated included landslides, debris flows, rock falls and surface fault rupture.

Landslide and Debris-Flow Hazard Evaluation, Central Utah: Evaluated the potential for debris flows and debris floods for a 30-mile portion of the Wasatch Front. Evaluated and rated more than 90 canyons in the project area for their potential to generate an event that could impact residential communities. Conducted reconnaissance of landslides and debris flows throughout central Utah during the period of high landslide activity in 1984. Provided reports to the Utah Geological Survey on conditions of landslides and debris flows that posed hazards, and provided 24-hour emergency assistance to City and County personnel by identifying and evaluating landslides, debris flows and flood hazards.

Geologic Hazards Evaluations, Utah and Wyoming: Evaluated site conditions at approximately 30 individual residential lots and proposed subdivisions (up to 3000 acres in size) to assess geologic hazards including seismic hazards, surface and ground-water impacts, landslides, and collapsible soils. Reports have been prepared in support of obtaining approval for septic drain fields, building permits, and subdivision approval.

Erosion and Sedimentation Evaluations

Sediment Yield Evaluation, Grants, New Mexico: Determined erosion rates, soil loss, and sediment yield from an 8,000-acre area disturbed by open-pit uranium mining. Developed a site-specific model that considered soil loss contributions from sheetwash, rill, gully, and stream-bank erosional processes. Sediment yield was evaluated for existing, post-reclamation, and pre-mining conditions at eight locations where drainages exited the mine site. The model results were tested by comparing the estimated sediment yield to the measured sediment accumulation in a downstream reservoir.

Erosion and Sediment Transport Investigation, Central Utah: Performed field measurements in ephemeral channels to document bank erosion, deposition, and impacts from past mining activities. Measured and mapped erosion features on disturbed slopes and mine waste piles, and evaluated their potential as sediment source contributors to the watershed drainage network. Calculated expected erosion rates and volumes, and modeled sediment transported in the stream channels. Assessed historic downstream deposition of tailings material.

Stream Channel and Floodplain Restoration Designs

Stream Channel Stability Evaluations and Design, Salina, Utah: Conducted an evaluation of two stream channels at a reclaimed mine site that had been damaged by high-runoff events. Channel stability was evaluated by considering the geomorphic setting, previous channel designs, stable upstream reaches, and examples from the literature. Prepared designs for reconstruction of the channels incorporating a series of buried grade control structures. Provided assistance in permitting the design and developed a program for construction supervision.

Stream Channel and Floodplain Evaluations and Design, Salt Lake City, Utah: Conducted an evaluation of existing hydrology on a 200-acre portion of the Jordan River Floodplain. Surface water features were surveyed and quantified; ground water flow was modeled based on data obtained from shallow bore holes. Designs were prepared for channels that would transfer surface water to dry parts of the floodplain in order to enhance shallow ground water available to plants. The project goals were to reestablish native floodplain vegetation to provide habitat for migratory birds. Channels were also designed to convey runoff from an adjacent site to the project area.

River Restoration, Carbon County, Utah: Designed a realignment and restoration of a 1,500-foot reach of the Price River that had been impacted by coal mining. Reviewed peak flows for various return-interval events, evaluated geomorphic stability, flow hydraulics, sediment transport, aesthetics, wildlife habitat, and costs to develop designs for river and floodplain restoration. Developed several conceptual design alternatives for client review and rated each alternative based on effectiveness, costs, long-term stability, maintenance requirements, permit considerations, and constructability.

Surface and Ground Water Investigations

Investigation of Lake Flooding, Southern Utah: Conducted an evaluation of the cause of recent flooding on property adjacent to Quichapa Lake. Investigations consisted of evaluation of aerial photographs, topographic maps, records of historic floods, climate records, vegetation, and playa sediments. Site investigations included flood boundary mapping and surveying, inspection of hydraulic control structures and channel geomorphic features, collection of tree sections for dating, and collection of sediment cores in order to determine cause of flooding and history of flooding in the lake basin.

Investigation of Flood Sources, Central Utah: Conducted an evaluation of the cause of recent flooding on property adjacent to the Sevier River. Investigations consisted of evaluation of aerial photographs, topographic maps, records of historic floods, and determining flood magnitudes and recurrence intervals. Site investigations included floodplain mapping and surveying, aerial reconnaissance during flood events, and inspection of hydraulic control structures in order to determine source of flooding.

Investigation of Potential Sources of Seepage, Great Salt Lake Beach, Utah: Conducted an evaluation of seepage and beach saturation in a complex industrial and hydrogeologic setting. Investigation consisted of reviewing reports of previous investigations, conducting field investigations and surveys, conducting finite element seepage modeling of ground-water flow, and investigating surface-water management of nearby water sources.

Runoff and Sediment Control Plans, Utah and Nevada: Performed the hydrology and hydraulics analyses and designed integrated runoff control plans at numerous mine and industrial facilities ranging in size to 300 acres. Determined runoff volumes, peak flows, and sediment yield. Plans were developed that would: direct upgradient runoff from undisturbed watersheds through the sites; control runoff generated on the sites and prevent it from mixing with the undisturbed area runoff; minimize the potential for on-site runoff to contact pollutants; direct perennial seepage water through the sites; and provide treatment for site runoff prior to its leaving the sites. Structures designed as part of these runoff control networks include earth-lined channels, riprap channels, biodegradable erosion control channel protection, water bars, drop structures, culverted road crossings, synthetic lined channels, spillways, and sedimentation ponds.

Regulatory Evaluations/Project Reviews

Building Permit Review, Northern Utah: Served as a member of the Morgan County Geologic Peer Review Board for purpose of reviewing geologic and geotechnical engineering reports submitted by applicants for building permits. Conducted public meetings, performed site inspections, and prepared written comments for Morgan County on several proposed residential developments.

Environmental Impact Statement Review, Northern Utah: Conducted a review of a Draft EIS prepared by the Army Corps of Engineers for a proposed 5,000-acre expansion of a tailings impoundment. Key technical issues were potential impacts to surface and ground water, adjacent wetlands, and the Great Salt Lake. An extensive summary report was prepared identifying specific items that needed clarification and/or additional information.

Environmental Assessment Review, Southern Utah: Conducted a review of an Environmental Assessment prepared by the BLM for a proposed chaining project on public and private land. Evaluated the geologic and hydrologic investigations conducted to support the impact assessment from sedimentation and erosion.

Hydropower Project Permitting Review, Western Colorado: Conducted reviews of the Draft and Final EIS, the Army Corps of Engineers 404 permit application, and supporting technical documents for the proposed AB Lateral Hydropower Project. The proposed project would divert about 900 cfs from the Gunnison River to the Uncompahgre River. Evaluated the impacts to the Uncompahgre River and prepared detailed technical comments on potential changes to stream geomorphology from bed scour and bank erosion.

Dam Permit Application Review, Central Utah: Conducted a review of a Federal Energy Regulatory Commission (FERC) application for a proposed dam and hydroelectric power plant on the Fremont River, near Capitol Reef National Park. Prepared comments on the adequacy of the geologic, geotechnical engineering, and hydrologic investigations conducted as part of the application package, and potential impacts to the river within the park.

Mine Permit Application Review, Southern Utah: Conducted several reviews over a three-year period of mine permit applications submitted to the Utah Division of Oil, Gas and Mining (DOGM) for a proposed coal mine on the Kaiparowits Plateau. The hydrology and geology sections of the permit application were evaluated and written comments were prepared on the adequacy of the baseline investigations, probable hydrologic consequences, monitoring plans, and impacts to surface and ground water.

Highway Design and Construction Review, Central Utah: Conducted reviews of design drawings, and construction specifications during a three-year period of highway construction for U.S. 189 in Provo Canyon, Utah. The geologic and hydrologic components of the project were evaluated for their compliance with NEPA and the Clean Water Act. Engineering geologic components of the project were evaluated, with emphasis on slope stability of hillslopes, cuts for the roadway, impacts to the Provo River, and mitigative measures. Prepared numerous written documents based on site inspections, surveys, data analysis, and interpretation.

Mine Permit Application Review, Central Utah: Conducted several reviews over a seven-year period of mine permit applications submitted to the Utah Division of Oil, Gas and Mining (DOGM) for a proposed coal mine along the Book Cliffs. The hydrology and geology sections of the permit application were evaluated and written comments were prepared on the adequacy of the baseline investigations, probable hydrologic consequences, monitoring plans, and impacts to surface and ground water.

Dams and Water Infrastructure

Engineering Geologic Investigations – Existing Dams, Utah: Conducted investigations at 13 existing high-hazard earthen dams for various water user associations in compliance with Utah Statutes and Administrative Rules for Dam Safety. Investigations have included preparing maps of surface and bedrock geology including landslides and faults; drilling, logging, and sampling test holes in existing dams and abutments; installation and monitoring of piezometers; evaluating liquefaction susceptibility; developing earthquake design parameters from both deterministic and probabilistic methods; and preparation of maps, cross-sections, logs, and reports.

Engineering Geologic Investigations – Monks Hollow Dam Site, Wasatch, County, Utah: Conducted investigation at the site of a proposed concrete arch dam on the Diamond Fork River for the Central Utah Water Conservancy District. Investigations included review of Bureau of Reclamation geologic and seismic reports and design drawings; inspection of exploratory tunnels in abutments, mapping surficial geology and faults, evaluating fault activity, and preparation of presentations and summary report.

Engineering Geologic Investigations – Water Storage Tank, Draper, Utah: Conducted geologic hazards investigations at three sites for a proposed 2.3 million gallon water storage tank in the Traverse Mountains. Hazards evaluated included landslides, debris flows, rock falls and surface fault rupture. Test pits and trenches were excavated, geologic logs were prepared of subsurface geology, landslide and fault activity was evaluated, and reports were prepared and summarized in a presentation to the Draper City Council.

Engineering Geology and Geologic Hazards Evaluations – Canal Enclosure, Utah County, Utah: Project consisted of evaluating engineering geology and geologic hazards for a proposed 22-mile long, 144-inch diameter pipeline along the base of the Wasatch Mountains. Hazards evaluated included landslides, debris-flows, surface-fault rupture, and rock fall. Soil properties were characterized from test hole, test pit, and trench logs according to surficial geologic units. Test holes were drilled, logged, and sampled in a one-mile wide landslide in order to assess landslide characteristics and activity. Active faults were mapped from aerial photographs, and potential rock-fall areas were delineated from field surveys. Results were summarized in a report and presentations were made to the Water Users Association.

Slope Stability Modeling and Remedial Design

Landslide Analyses and Remediation, Central Utah: Conducted three separate analyses of recent landslides that occurred on a pipeline right-of-way, a reclaimed mine, and an active mine. Projects including detailed mapping of landslide features, conducting seismic profiles, installing borings and piezometers, collecting samples, conducting laboratory testing, and conducting computer stability analysis. Based on the analyses, remediation designs were developed to increase stability by controlling surface and shallow ground water, and regrading the landslides to stable configurations.

Sediment Pond Stability Evaluation, Salina, Utah: Conducted stability analysis and prepared hydraulic designs for an earth embankment of a sediment pond. Stability was evaluated for full-reservoir and rapid-drawdown conditions under static and pseudo-static scenarios. Based on these analyses, a new embankment was designed and a report was prepared including construction drawings for the embankment as well as for the primary and secondary spillway structures.

Seismic Hazard Evaluations

Liquefaction Analysis, Wasatch Front, Utah: Evaluated liquefaction potential for four sites along the Wasatch Front. Factors considered were presence and depth of liquefiable layer of loose sand identified from blow counts in previous geotechnical borings, depth of ground water, and horizontal acceleration of gravity resulting from an earthquake on nearby faults. Probability of liquefaction for specified periods of time, and the amount of settlement that would result was estimated at each site.

Fault Rupture Investigations, Western United States: Conducted aerial photo interpretation, low sun-angle aerial reconnaissance, drill log and core examination, topographic and stream channel profiling, and trench logging as part of investigations of normal and accommodation faults in Arizona, Montana, Nevada, and Utah. Have participated in, or directed, approximately 20 individual surface fault rupture investigations for projects ranging from single-family lots and commercial/industrial facilities to 50-acre subdivisions.

Paleoenvironmental Reconstruction

Investigation of Paleolakes, Central Utah: Conducted an investigation to document the presence of lacustrine ecosystems in the southern Bonneville Basin during the Paleoindian period. Sediments were retrieved from deep bore holes in four present day playas and sub basins of Lake Bonneville. Chronological control was established based on radiocarbon analysis. Paleoenvironmental conditions within the region were derived from analysis of biological and geochemical indicators preserved in the sediments.

Paleoenvironmental Reconstruction, Southeastern Wyoming: Conducted investigations to reconstruct paleoenvironmental conditions for the Snowy Range and Carbon Basin during the late Pleistocene and the Holocene. Sediment cores were retrieved from five modern lakes and sediments were analyzed for sedimentological, biological, geochemical, and isotopic indicators of past climate and environmental conditions. Chronological control was established based on radiocarbon analysis.

PUBLICATIONS

Wieczorek, G. F., Ellen, Stephen, Lips, E. W., Cannon, S. H., and Short, D. N., 1983, Potential for debris flow and debris flood along the Wasatch Front between Salt Lake City and Willard, Utah, and measures for their mitigation: U.S. Geological Survey Open-File Report 83-635, 25 p., map scale 1:100,000, Reprinted in Utah State Bar, 1983, Conference on Legal and Legislative Approaches to Western States Geological Hazards: November 1983, Salt Lake City, p. 53-116.

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- Lips, E. W., 1990, Characteristics of debris flows in central Utah, 1983: Fort Collins, Colorado, Colorado State University M.S. thesis, 66 p.
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- Keaton, J. R. and Lips, E. W., 1994, Why probabilistic estimates sometimes exceed deterministic estimates for the maximum earthquake acceleration: Association of Dam Safety Officials, 1994 Western Regional Conference Proceedings, p. 99-104.
- Lips, E. W. and Keaton, J. R., 1994, The operating basis earthquake for dams: making sense of the numbers game: Association of Engineering Geologists 37th Annual Meeting, Program and Abstracts, p. 54.
- Currey, D., Lips, E. W., Thein, B., Wambeam, T., and Nishazawa, S., 2001, Elevated Younger Dryas lake levels in the Great Basin, western U.S.A.: Geological Society of America, Abstracts v. 33, no. 6, p. A-217.
- Lips, E. W., Marchetti, D. W., and Gosse, J., 2005, Revised chronology of late Pleistocene glaciers, Wasatch Mountains, Utah: Geological Society of America, Abstracts v. 37, no. 7, p. 41.
- Godsey, H. S., Atwood, G., Lips, E. W., Miller, D. M., Milligan, M., and Oviatt, C. G., 2005, Don R. Currey Memorial Field Trip to the shores of Pleistocene Lake Bonneville: Geological Society of America, Field Trip Guide 6, p. 419-448.
- Marchetti, D. W., Cerling, T. E., and Lips, E. W., 2005 A glacial chronology for the Fish Creek drainage of Boulder Mountain, Utah, USA: Quaternary Research 64, p. 263-271.